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AUTHOR Smith, Lyle R.; Land, Michael L.
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ABSTRACT

One hundred sixty college students were randomly assigned to eight groups defined by the possible combinations of teacher vagueness in instruction (vagueness v. no vagueness), teacher mazes conditions (mazes are defined as false starts or halts in speech, redundancy, and semantically nonsensical word combinations), and additional unexplained content (terms left undefined by the teacher and material not directly related to lesson content). Each group was presented a lesson on mathematical concepts. After the lesson each group was tested on comprehension of the concepts and the students evaluated the lesson presentation. The groups whose lessons contained no teacher vagueness or mazes performed better than those with vagueness. Student evaluations of the lessons indicated that students were able to distinguish between lessons with high and lower degrees of clarity. Further, student evaluations of the lessons were correlated singificantly with student achievement. These findings are discussed in relation to previous research on teacher clarity and student perceptions of clarity. (Author/MSE)

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Student Perception of Teacher Clarity

Lyle R. Smith

Augusta College

and

Michael L. Land

Missouri Southern State College

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Abstract

College students (n = 160) were each randomly assigned to one of eight groups defined by the possible combinations of teacher vagueness conditions (vagueness vs. no vagueness), teacher mazes conditions (mazes vs. no mazes), and additional unexplained content conditions (extra content vs. no extra content). Each group was presented a lesson concerning mathematical concepts. After the lesson, each group was tested on comprehension of the concepts, and then the students evaluated the lesson presentation. The groups whose lessons contained no teacher mazes (no teacher vagueness) performed better on the test than the groups whose lessons contained teacher mazes (teacher vagueness). Student evaluations of the lesson indicated that students were able to distinguish between lessons with a high degree of clarity and lessons with lower degrees of clarity. Further, student evaluations of the lessons were correlated significantly with student achievement. These findings are discussed in relation to previous research on teacher clarity and student perceptions of teacher clarity.

Those who question the value of student evaluations of instruction suggest that the student lacks the perspective to assess instructional effectiveness. However, studies by Frey (1973) and Marsh, Fleiner, and Thomas (1975) revealed that, when different instructors of the same course gave a common final examination, the sections who gave high (low) ratings to their instructors most frequently made high (low) examination scores. These studies suggest that student evaluations of instruction are fairly reliable indicators of effective instruction as measured by student achievement.

According to Rosenshine (1971), teacher clarity is an important aspect of effective instruction. Research has shown that students are generally consistent in evaluating teacher clarity (Fortune, Gage, and Shutes, 1966; Belgard, Rosenshine, and Gage, 1969; Bush, Kennedy, and Cruickshank, 1977; Kennedy, Cruickshank, Bush, and Myer, 1978). However, these studies do not present evidence of student ratings being validated against operationally defined degrees of teacher clarity (as documented by the presence or absence of low inference indicators).

A number of low inference indicators of teacher clarity have been identified. Among these indicators are vagueness terms, mazes, and additional unexplained content.

Hiller, Fisher, and Kaess (1969) identified more than 200 vagueness terms. These are words or phrases indicating approximation, unclarity, or lack of assurance. Hiller et al. reported a negative correlation between student achievement in social studies and the frequency of teacher vagueness terms. In a correlational study of student achievement in mathematics, Smith (1977) supported the findings of Hiller et al. Smith and Edmonds (1978) and Land

and Smith (1979) reported experimental studies indicating that a high frequency of teacher vagueness terms negatively affects student achievement in mathematics.

Smith (1977) identified mazes as false starts or halts in speech, redundantly spoken words, and combinations of words that do not make semantic sense. Land and Smith (1979) reported that student achievement in mathematics is negatively affected by a high frequency of teacher mazes.

Linville (1970) studied difficulty of syntax and vocabulary in fourth-grade mathematics. Students reportedly achieved higher when syntax and vocabulary were not complex. In an attempt to replicate the conditions of the Linville study, Land and Smith (1979) defined additional unexplained content to be terms that are left undefined by the teacher and that are not directly related to the content of the lesson. Such terms would be expected to increase the difficulty of the syntax and vocabulary of the lesson.

The present study addresses the following questions: (1) What are the combined effects of teacher vagueness terms, mazes, and additional unexplained content on student evaluations of instruction and on student achievement? (2) What is the relation between student perception of teacher clarity and student achievement?

METHOD

The present research is an extension of a previous study by Smith and Edmonds (1978), in which a high frequency of teacher vagueness terms reportedly influenced pupil learning negatively ($p < .05$). As in the 1978 study, undergraduate college students were shown a 19 to 21 minute videotaped mathematics lesson on sums of consecutive positive integers (SCPIs). The same concepts, generalizations, and processes discussed by Prielipp and Kuenzi (1975) were

presented in each lesson. None of the students had prior knowledge of SCPIs.

In the present study, a 2(teacher vagueness terms vs. no teacher vagueness terms) X 2(teacher mazes vs. no teacher mazes) X 2(additional unexplained content vs. no additional unexplained content) experimental design was used. The vagueness condition employed an average of 7.5 vagueness terms per minute. The mazes condition used an average of 5.1 mazes per minute. The additional unexplained content condition contained 0.75 additional unexplained terms per minute. These three types of teacher discourse were placed into lesson scripts in as natural an order as was possible. The attempt to construct the lessons so that they seemed to represent natural and consistent presentations was the primary reason for the seemingly arbitrary levels set for vagueness terms, mazes, and additional unexplained content.

The lessons were videotaped by one teacher to control for extraneous variables. The teacher's presentation was read from a script while the camera focused on corresponding content that was shown on transparencies with an overhead projector. Thus each of the eight lessons contained the same substantive content, the same sequence of presentation, and approximately the same rate of teacher talk. The only difference was that each of the eight lessons represented a different combination of the teacher's use of vagueness terms, mazes, and additional unexplained content.

The following two paragraphs are excerpts from different sections of the lesson with no vagueness terms, no mazes, and no additional unexplained content.

"We say 5 is not a divisor of 14, since we get a remainder of 4 when we divide 5 into 14. How many divisors does 15 have? Write them down. (Pause

for 8 seconds.) You should have written down 4 divisors for 15: 1, 3, 5 and 15."

"Here is a rule that tells how to compute how many ways a number can be written as an SCPI. First, find the largest odd divisor of the number. Second, find the number of divisors the largest odd divisor has. Third, subtract 1 from the number of divisors of the largest odd divisor."

The following two paragraphs are corresponding excerpts from the lesson with vagueness terms, mazes, and additional unexplained content: [vagueness terms], (mazes), additional content.

"We, [of course], say 5 is not a (divi,uh,) divisor of 14, since we (we,uh,we) get a remainder of 4, [you know], when we divide 5 into 14. This ties in with modular arithmetic, since 14 is congruent to 4 mod 5. How many divisors does 15 have? Write them down. (Pause for 8 seconds.) It [seems] that 15 has 4 divisors: 1, 3, 5, and 15."

"Here is what we [might] call (a guide, rule) a rule that tells how to compute how many ways (to write, tells how many ways) a number can be written as an SCPI. First, find the largest odd divisor (uh, largest, largest odd divisor) of the number. Second, [in essence], find the number of (ways, number of) divisors the largest odd divisor has. Third, subtract 1 from the number of divisors. We can refer to this process as an algorithm."

The presence or absence of vagueness terms, mazes, and additional unexplained content dictated slight variability in total lesson times (19 to 21 minutes), since rate of teacher talk and time allowed for pauses were held constant.

The 160 students were enrolled in introductory education and psychology classes at Peru State College in Nebraska. Nearly 55 percent of the students

were females and approximately 80 percent were of Caucasion ancestry. Each student was randomly assigned to one of the eight experimental conditions (n = 20 each). The students were told that they would view a mathematics lesson, that they were to take notes, and that they would be tested over the lesson content. Student comprehension was determined by administering a 17-item test immediately after each lesson was completed. The test focused on concepts, generalizations, and processes presented by Prielipp and Kuenzi (1975), with primary focus on identifying SCPIs, determining the number of ways an integer can be written as an SCPI, and writing integers as SCPIs. The reliability of the test was .97 based on the Kuder-Richardson formula 20. After the students completed the test, they then completed a 13-item evaluation of the lesson (Table 1). The numbers in parentheses were used for scoring purposes so that a higher number indicated a better rating than a lower number indicated. These numbers did not appear on the student forms.

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Insert Table 1 about here .

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RESULTS

A 2 X 2 X 2 analysis of variance was performed on each of 15 dependent variables: the scores for each of the 13 response items on the Lesson Evaluation Form, the scores for the combined totals on the Lesson Evaluation Form, and the posttest student achievement scores. The means and standard deviations for all 15 dependent variables are shown for each of the eight experimental conditions in Table 2. Table 3 presents the F ratios for each of the 2 X 2 X 2 ANOVAs.

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Insert Table 2 about here.

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Insert Table 3 about here.

The No Vagueness condition produced higher achievement scores than the Vagueness condition, although significance did not quite reach the .05 level. The No Mazes condition produced significantly higher achievement ($p < .02$) than the Mazes condition. Neither the main effect due to Additional Content nor any of the interactions were significant when achievement was the dependent variable.

Since the results concerning achievement are discussed elsewhere (Land and Smith, 1979), the emphasis here is placed on the analyses of the responses on the Lesson Evaluation Form. Tables 2 and 3 indicate that the No Mazes condition produced significantly better student response scores ($p < .001$) than the Mazes condition on all 13 response items, as well as on the total for all response items. The No Vagueness condition produced significantly better student response scores (beyond the .05 level) than the Vagueness condition for response items 1, 3, 5, 6, 7, 11, 12, and the total for all response items. On all other items except for items 4 and 13, the No Vagueness condition produced better (though not significantly better) response scores than the Vagueness condition. On item 4 ("The lesson frustrated me") and item 13 ("The teacher appeared aloof"), the Vagueness condition produced virtually the same response mean scores as the No Vagueness condition. The main effect due to Additional Content was not significant for any of the response items or for the total for all response items, although the responses for item 6 ("The teacher stayed on the main subject very well"), item 8 ("The speech pattern of the teacher irritated me"), and item 13 ("The teacher appeared aloof") showed slight trends in favor of the No Extra Content condition over the Extra

Content condition. Responses for item 5 ("The teacher's explanations were clear to me"), and item 7 ("The teacher really knew what he was talking about") showed small trends in favor of the Extra Content condition over the No Extra Content Condition.

Table 3 indicates that the Vagueness variable interacted significantly with the Mazes variable on all response items except for items 3, 6, 12, and 13. Figure 1 shows the relationships between the mean response scores on item 5 for the Vagueness variable and the Mazes variable. Relations quite similar to those in Figure 1 exist for the other response items in which the two variables interacted.

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Insert Figure 1 about here.

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The Vagueness variable interacted significantly with the Additional Content variable only on item 6 ("The teacher stayed on the main subject very well"). The Mazes variable interacted significantly with the Additional Content variable on item 1 ("The teacher was confident") and on item 4 ("The lesson frustrated me"). Interactions between all three variables were found for item 5 ("The teacher's explanations were clear to me"), item 6 ("The teacher stayed on the main subject very well"), and item 12 ("The teacher appeared lazy"). The most significant interaction ($p < .002$) between all three variables occurred for item 12, in which one of the most striking differences in group mean rating scores was between the Vagueness, Mazes, No Additonal Content condition ($\bar{x} = 2.30$) and the Vagueness, Mazes, Additonal Content condition ($\bar{x} = 2.85$). On the other hand, the Vagueness, No Mazes, No Additonal Content condition had a group mean of 3.10 as compared to a group mean of 2.70 for the Vagueness, No Mazes, Additional Content condition.

To determine whether the student evaluations of instruction were related

to student achievement, the mean scores for the combined totals on the Lesson Evaluation Form were ranked from 1 to 8 and were compared with the rankings of the mean achievement scores for each of the eight experimental conditions. The rankings are shown in Table 4. The value of the Spearman rank-order correlation was .786, significant at the .05 level.

- -
Insert Table 4 about here.
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DISCUSSION

The results of this study indicate a cause-effect relationship between teacher mazes and student achievment. To a less significant degree, there is an indication of a cause-effect relationship between teacher vagueness terms and student achievement. This supports the findings of Smith and Edmonds (1978). Additional unexplained content had no significant effect on student learning. It may be that the terms selected for this variable (such as "algorithm", "infinite sequences", "modular arithmetic", and "computational principles") persuaded some students that the teacher had a grasp of the information to be taught. That is, even though the extra terms were superfluous and were left unexplained, they may partially have counterbalanced the use of vagueness terms and mazes by inducing students to perceive the teacher as competent. This rationale is supported by two studies (Ware and Williams, 1975; Williams and Ware, 1977) in which students rated certain lessons high even when the lessons contained unrelated examples or anecdotes. Further support for this rationale comes from the fact that, in the present study, item 7 ("The teacher really knew what he was talking about") was the only item on the Lesson

Evaluation Form that approached the .05 significance level in favor of Additional Unexplained Content over No additional Unexplained Content. Further research is needed to determine the effect of this variable on achievement and on student evaluations of instruction.

One might argue that any "noise" could be introduced into the teaching act, regardless of whether this "noise" is in the form of vagueness terms and mazes or in another form, and if the "noise" were "turned up loud enough", then it would confuse the students. However, vagueness terms and mazes have been shown to frequent discourse of mathematics teachers. In fact, Smith (1977) reported observing some mathematics teachers who used an average of four vagueness terms per minute and other mathematics teachers who used an average of six mazes per minute. In the present study, the lessons were constructed so that the use of vagueness terms and mazes simulated the ways in which these teachers conducted classroom discourse.

Comment should be made concerning the use of videotaped lessons as opposed to "live" presentations. Live presentations provide more natural settings, but it is extremely difficult to control variables when studying live presentations. Even though Taveggia (1974) reviewed research that indicated there is no significant difference between academic achievement of students instructed face-to-face and achievement of students presented televised lessons, there is a need for more descriptive research involving live presentations. Such descriptive research should be the basis for studies such as the present one.

The results of this study indicate that student evaluations of instruction

can be useful indicators of instructional effectiveness as defined by the presence or absence of low-inference teacher behaviors. Students generally were able to discriminate between lessons that contained vagueness terms and/or mazes and lessons that did not contain such phrases. Further, student evaluations were reasonably accurate predictors of student achievement, as evidenced in Table 4. In the present study, the Lesson Evaluation Form was administered after the posttest was administered. Investigation concerning the order of administration of posttest and student evaluation should be conducted. That is, would the results have been similar if the Lesson Evaluation Form had been administered prior to the posttest?

Perhaps the single most relevent suggestion for teacher training and teacher evaluation is that low inference indicators of teacher effectiveness be identified and that training and evaluation focus on these particular indicators. Student outcomes, both in terms of student perceptions and in terms of achievement, should be integral parts of the training and evaluation process.

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Table 1

Lesson Evaluation Form

	definite no	no	yes	definite yes
1. The teacher was confident.	(1)*	(2)	(3)	(4)
2. I was confident of the materials being presented.	(1)	(2)	(3)	(4)
3. The teacher was serious about the lesson	(1)	(2)	(3)	(4)
4. The lesson frustrated me	(4)	(3)	(2)	(1)
5. The teacher's explanations were clear to me.	(1)	(2)	(3)	(4)
6. The teacher stayed on the main subject very well.	(1)	(2)	(3)	(4)
7. The teacher really knew what he was talking about.	(1)	(2)	(3)	(4)
8. The speech pattern of the teacher irritated me	(4)	(3)	(2)	(1)
9. The lesson irritated me.	(4)	(3)	(3)	(1)
10. The teacher appeared nervous	(4)	(3)	(2)	(1)
11. The teacher was prepared	(1)	(2)	(3)	(4)
12. The teacher appeared lazy.	(4)	(3)	(2)	(1)
13. The teacher appeared aloof	(4)	(3)	(2)	(1)

*(The number in parentheses indicates the value given to that response, for scoring purposes.)

Table 2

Group Means and Standard Deviations

Vagueness Terms (A)		No	No	No	Yes	Yes	Yes	No	Yes	
Mazes (B)		No	No	Yes	No	Yes	No	Yes	Yes	
Extra Content (C)		No	Yes	No	No	No	Yes	Yes	Yes	Totals
Response Item	1	3.50 (0.50)[a]	3.35 (0.48)	1.55 (0.74)	2.65 (0.79)	1.30 (0.56)	2.55 (0.67)	1.80 (0.75)	1.65 (0.57)	2.29 (1.02)
	2	2.90 (0.70)	2.45 (0.67)	1.65 (0.57)	2.35 (0.79)	1.55 (0.59)	2.25 (0.77)	1.60 (0.66)	1.70 (0.46)	2.06 (0.81)
	3	3.55 (0.50)	3.45 (0.59)	2.75 (0.62)	2.90 (0.44)	2.20 (0.75)	2.95 (0.59)	2.65 (0.85)	2.60 (0.86)	2.88 (0.79)
	4	2.65 (0.65)	2.65 (0.65)	1.55 (0.50)	2.60 (0.80)	2.00 (1.00)	2.20 (0.75)	2.05 (0.50)	2.15 (1.01)	2.23 (0.84)
	5	2.80 (0.68)	3.35 (0.65)	1.65 (0.57)	2.45 (0.67)	1.40 (0.49)	2.40 (0.73)	1.50 (0.59)	1.70 (0.64)	2.16 (0.91)
	6	3.30 (0.56)	3.20 (0.40)	2.80 (0.51)	2.95 (0.67)	2.20 (0.87)	2.75 (0.43)	2.10 (0.94)	2.45 (0.74)	2.72 (0.78)
	7	3.20 (0.40)	3.20 (0.40)	2.20 (0.68)	2.50 (0.74)	1.90 (0.77)	2.60 (0.58)	2.30 (0.90)	2.45 (0.80)	2.54 (0.81)
	8	3.05 (0.39)	2.90 (0.44)	1.75 (1.04)	2.45 (0.80)	2.10 (1.22)	2.30 (0.78)	1.70 (0.90)	1.50 (0.74)	2.22 (0.99)
	9	2.90 (0.54)	2.85 (0.65)	1.75 (0.62)	2.40 (0.66)	2.20 (0.98)	2.35 (0.79)	2.05 (1.12)	2.00 (0.95)	2.31 (0.90)
	10	3.30 (0.46)	3.20 (0.40)	1.50 (0.59)	2.55 (0.74)	2.15 (1.11)	2.50 (0.59)	1.70 (0.95)	1.65 (0.65)	2.32 (0.97)
	11	3.45 (0.59)	3.20 (0.40)	2.25 (0.37)	2.85 (0.65)	2.20 (0.81)	2.75 (0.43)	2.20 (0.87)	2.30 (0.78)	2.65 (0.79)
	12	3.10 (0.62)	3.30 (0.46)	2.80 (0.51)	3.10 (0.70)	2.30 (0.84)	2.70 (0.46)	2.60 (0.66)	2.85 (0.65)	2.84 (0.69)
	13	3.05 (0.22)	2.95 (0.50)	2.45 (0.59)	3.05 (0.59)	2.50 (0.92)	2.70 (0.46)	2.30 (0.71)	2.50 (0.67)	2.69 (0.67)
Total for All Response Items		40.75 (5.92)	40.05 (4.55)	26.65 (7.13)	34.80 (8.22)	26.00 (10.12)	33.00 (7.15)	26.55 (9.99)	27.50 (8.61)	31.91 (9.79)
Achievement Scores		8.10 (3.45)	7.65 (4.25)	5.80 (2.97)	6.15 (2.68)	5.25 (3.63)	6.40 (3.73)	6.25 (4.23)	5.70 (3.08)	6.41 (3.57)

[a] Figures in parentheses are the standard deviations.

Table 3

F Ratios of ANOVA s

Variable	Source						
	Vagueness(A)	Mazes(B)	Extra Content(C)	AXB	AXC	BXC	AXBX
Response Item 1	31.82[f]	250.45[f]	<1	11.88[f]	<1	5.50[b]	<1
2	3.06	64.96[f]	1.09	3.90[a]	1.67	2.33	<1
3	16.38[f]	37.58[f]	<1	1.63	2.27	<1	<1
4	<1	22.92[f]	<1	4.59[a]	2.35	4.59[a]	<1
5	10.81[e]	133.97[f]	2.50	9.30[d]	<1	<1	6.5
6	5.86[b]	37.42[f]	2.99	1.63	3.88[a]	<1	5.8
7	14.15[f]	47.30[f]	3.77	8.94[d]	2.06	2.06	<1
8	3.78	45.74[f]	3.09	6.26[b]	1.05	<1	1.0
9	1.30	22.49[f]	<1	7.04[c]	<1	<1	<1
10	3.28	94.09[f]	<1	18.21[f]	1.94	<1	3.4
11	5.77[b]	62.88[f]	<1	6.47[b]	<1	<1	<1
12	4.36[a]	16.46[f]	<1	<1	<1	1.85	11.0
13	<1	29.49[f]	2.95	1.45	<1	<1	1.3
Total for All Response Items	6.18[b]	60.21[f]	<1	6.75[b]	<1	<1	<1
Achievement Scores	3.69	5.60[b]	<1	<1	<1	<1	<1

a) $p < .05$ b) $p < .02$ c) $p < .01$ d) $p < .005$ e) $p < .002$ f) $p < .001$

Table 4

Rankings for Student Lesson Evaluations and Student Achievement

Experimental Condition			Rankings	
Vagueness	Mazes	Extra Content	Lesson Evaluations	Achievement
No	No	No	1	1
No	No	Yes	2	2
No	Yes	No	6	6
Yes	No	No	3	5
Yes	Yes	No	8	8
Yes	No	Yes	4	3
No	Yes	Yes	7	4
Yes	Yes	Yes	5	7

$\rho = .786$, $p < .05$

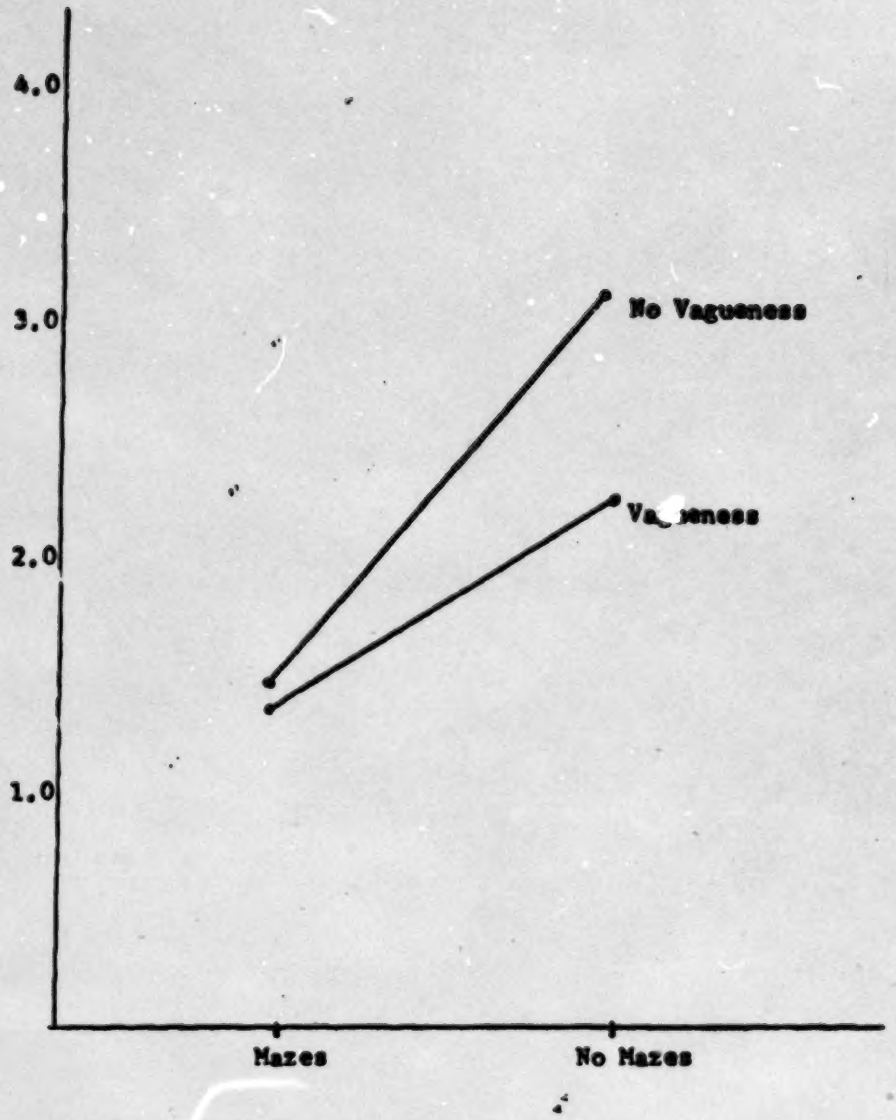

Figure 1. Vagueness X Mazes for Response Item 5